

EXHIBIT 3

Declaration of Constance Senior

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

THE STATE OF OHIO,

and

THE UNITED STATES OF AMERICA,

Plaintiffs,

v.

Civil Case No. 23-cv-517

Hon. John R. Adams

NORFOLK SOUTHERN RAILWAY
COMPANY,

and

NORFOLK SOUTHERN CORPORATION,

Defendants/ Third-Party Plaintiffs,

v.

OXY VINYLs LP, GATX
CORPORATION, GENERAL
AMERICAN MARKS COMPANY,
TRINITY INDUSTRIES LEASING
COMPANY, SMBC RAIL SERVICES
LLC, DOW CHEMICAL
INCORPORATED, and UNION TANK
CAR COMPANY,

Third- Party Defendants.

**DECLARATION OF CONSTANCE SENIOR IN SUPPORT OF THE UNITED STATES'
MOTION TO ENTER**

I, Constance Senior, declare and state as follows:

1. I received a Bachelor of Science degree in Chemical Engineering from Rice University in June 1978, a Master of Science Degree in Environmental Engineering Science from the California Institute of Technology in June 1979, and a PhD in Environmental Engineering Science from the California Institute of Technology in June 1984.
2. In addition to my degrees, I have been a member and office holder of various professional associations whose activities are highly relevant to the issues in this case. I have been a long-time member of the Air and Waste Management Association, where I held leadership positions in the Technical Committee on Control of Acid Gases, Trace Metals, & Particulate Matter from 2003 to 2009, and was Chair or Vice Chair of the Emissions Control Technology Division from 2006 to 2011. From 2017-2018, I was Co-Chair of the Domestic Conventional Pollutants Division of the Institute of Clean Air Companies, and from 2017-2021 a member of the National Coal Council. I was on the U.S. government's EPA Board of Scientific Counselors, for the Air and Energy Subcommittee, from 2014-2021. Over the past 40 years, I have been the author or co-author of dozens of book chapters and peer-reviewed journal articles relating to the chemistry of combustion and its application to air pollution control and industrial manufacturing. I am a co-inventor on a dozen patents in the field of air pollution control from combustion systems.
3. I am currently the Executive Editor-in-Chief of *Clean Energy*, a peer-reviewed research journal for topics relating to clean energy.

4. I am making the statements in this declaration based on my personal knowledge gained through my education and professional experience in the field of environmental engineering, conducting environmental compliance and enforcement inspections, and knowledge I have gained from reviewing documents specifically related to this case. If called upon to testify, I will testify as to the facts set forth herein.
5. I have reviewed the statements made by Dr. George Thompson related to the chemicals and combustion byproducts formed as a result of the train derailment in East Palestine, Ohio and the subsequent fires, including the intentional burning of vinyl chloride monomer.
6. Dr. Thompson's remarks assume that every possible chemical byproduct that could have been formed was formed, that every chemical byproduct that was formed spread over 165,000 sq. miles, and that every chemical byproduct that was formed then persisted at levels which are harmful. For the reasons, discussed below, these assumptions are not reasonable.
7. In Table 2 of Dr. Thompson's comment, he lists chemicals he says were released by the fire and associated health hazards. However, much of what is listed in his Table 2 are general classes of chemicals, such as "aldehydes" and "ketones", rather than specific chemical compounds.
8. Dr. Thompson's analysis does not address the critical elements of (1) what harmful products of incomplete combustion were actually formed or (2) what were the concentrations of the harmful products.
9. Dr. Thompson assumes that "the railcars designated on the Norfolk Southern manifest that burned contained 5,330,000 pounds of materials, and the cars listed as 'impinged'

contained an additional 3,220,000 pounds of materials, for a total of 8,580,000 pounds of chemicals released into the atmosphere.” I believe that Dr. Thompson’s assumption that 100% of the contents of the spilled cars burned is incorrect, considering that some cars only lost partial loads to combustion, because some of the contents spilled into the soil and some flowed into the creek. (For reference, see the National Transportation Safety Board report of 25 June 2024, Railroad Investigation Report RIR-24-05, pp. 52-55.)

10. This difference in the amount of material burned would impact the amount and number of chemical byproducts produced.
11. The chemical reactions that occurred within the confined areas of the rail cars and in the open areas associated with the pool fires were a combination of pyrolysis (chemical decomposition when organic materials are heated in the absence of oxygen) and oxidative combustion (when the materials chemically react with oxygen in the air, releasing heat and light).
12. Complete combustion forms a known set of products; incomplete combustion produces a wider range of products that depends on temperature, oxygen availability, and other variables.
13. The products of complete combustion of hydrocarbons (most of the chemicals on the train) are water (H_2O), carbon dioxide (CO_2), and the oxidized products of other species like nitrogen (e.g., NO_2), sulfur (e.g., SO_2), and chlorine (e.g., HCl , Cl_2). Combustion may not be complete, however. Incomplete combustion may produce carbon monoxide (CO), soot, and various unburned hydrocarbons.
14. The mix of combustion products created in a fire varies depending on the temperature, the availability of oxygen, and time at temperature.

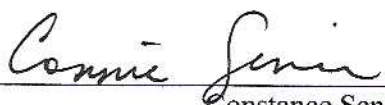
15. Under the conditions that were present during the burning of the contents of the rail cars in East Palestine, it is not possible using laboratory measurements alone to know with specificity what chemical compounds were actually released into the air and at what concentrations. The best measure of the chemical compounds created and released during the fire and the concentration of those chemical compounds is through real-time air monitoring observations.
16. Air sampling measurements were carried out by EPA and Norfolk Southern after the derailment. EPA has provided an on-line database of air sampling measurements from East Palestine from 2/4/23 to 1/6/24 (<https://www.epa.gov/east-palestine-oh-train-derailment/air-sampling-data>). These samples were collected at various fixed locations, mostly within a 2-km radius of the derailment site, and using different methods to quantify sixty-seven organic compounds.
17. As part of the air monitoring, EPA deployed twelve (12) AreaRAE Pro units which monitored vinyl chloride monomer and other volatile organic compounds (VOCs), hydrogen cyanide (HCN), carbon monoxide (CO), hydrogen sulfide (H₂S), and lower explosive limit (LEL). Additionally, roaming air monitoring was used for particulate matter (i.e., PM_{2.5} and PM₁₀), hydrogen cyanide (HCN), benzene, phosgene, and hydrochloric acid (HCl). These measurements were made near ground level.
18. I have reviewed the air monitoring data collected by EPA and Norfolk Southern focusing on February 2023, in order to determine, based on the available data, the effects of the controlled burn on February 6, 2023 on local concentrations of combustion byproducts in the air.

19. A review of the data on organic compounds showed that measured concentrations exceeded the detection limit for a total of sixty-six (66) organic compounds. Most of these compounds had measured concentrations at very low levels, much less than 1 part-per-million (ppm) in air. Observed concentrations decreased significantly in the week following the controlled burn.
20. Regarding the concentrations of airborne chemicals, I make the following additional observations. (Note that the discussion does not address any reactions of chemicals released into air with deposits in soil or in water.) The products of combustion and pyrolysis of the contents of various rail cars from the derailment mixed with the air, which diluted the concentrations in the air downwind of the derailment. The farther downwind the distance, the greater the degree of dilution would be. Estimates of downwind concentrations can be computed with a model such as HYSPLIT which is capable of complex transport, dispersion, chemical transformation, and deposition simulations. However, as noted above, there is uncertainty as to the identity of the suite of combustion products and their concentrations in air at the derailment site. The chemical transformations of the contents of the rail cars, which led to subsequent dispersion in the ambient atmosphere, required elevated temperatures from the fires. Once these products of combustion and pyrolysis formed at elevated temperature, their reactions quenched as additional ambient air mixed with them and cooled them downstream of the fires/derailment site. In summary, the products of combustion are not specifically known and would have had highest concentrations within the plume near the derailment site, with decreasing concentrations as additional air mixed with them downstream of the derailment site.

21. I have reviewed the work by David A. Gay *et al.*, *Widespread Impacts to Precipitation of the East Palestine Ohio Train Accident*, published in Environmental Research Letters, 2024, 19:074022. Gay *et al.* correlate elevated chloride levels and elevated pH levels in precipitation samples taken under the National Atmospheric Deposition Program during the week of the derailment and subsequent releases, over a similar geographical region predicted from NOAA's HYSPLIT modeling to have been downwind of the East Palestine derailment site.
22. HYSPLIT is the core engine of NOAA's Air Resource Laboratory (ARL) transport-dispersion modeling activities and it is one of the most widely used models for atmospheric trajectory and dispersion calculations in the US and internationally.
23. The authors inferred that the historically high chloride and pH levels seen in deposition samples were likely a result of the controlled burn of vinyl chloride monomer and the combustion of other chemicals burned as a result of the derailment. It should be noted that only trajectories were modeled, and chemical reactions were not included in the model runs. If Gay *et al.* are correct, their research provides evidence that emitted chemicals from the burn could have been transported over a large area. However, it does not provide information on concentrations of chemicals in the air. This research does not provide a reasonable basis for the conclusions drawn by Dr. Thompson.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct.

Executed on: October 4, 2024


Constance Senior